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ABSTRACT

This paper discusses the long-term effects of preschool experience on sixth and seventh grade students. Subjects (n=200) were primarily black, lower-SES, Head Start children who, in 1968-69, were randomly assigned to one of four preschool programs: Bereiter-Engelmann, Darcee, Montessori, and Traditional. In 1976-77, approximately 140 of the children were given the Wechsler Intelligence Scale for Children - Revised (WISC-R) and the Stanford Achievement Test (SAT). Overall "F" Tests on the achievement scores of sixth graders indicated two significant differences among programs on Reading Comprehension (p=.05) and Spelling (p=.05). Program differences on Reading Total scores were significant at the .10 level. Among seventh graders there were program differences on Reading, Spelling, and Language subtests (p=.10). Four multi-variate analyses of variance comparing the SAT Total Reading and Total Math scores and WISC-R Verbal and Performance IQ scores of children in each of the four programs indicated that the Montessori program was consistently superior to the other three programs, although these program differences were not statistically significant. Comparison of sixth and seventh grades shows that preschool program participants made average gains of 6 months in Total Reading and 1 month in Total Math. At grade seven, three groups remained 1 year behind grade level. The Montessori group was about a half year behind grade level. There were no significant IQ differences between the groups. Long-term program effects on achievement were found. Overall, children from the Montessori program consistently outperformed the others. (Author/RH)

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FOUR PRESCHOOL PROGRAMS: THEIR LASTING EFFECTS

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The research at Louisville began ten years ago when four preschool programs (Bereiter-Engelmann, Darcee, Montessori, and Traditional) were studied. The major objective was to collect and examine various test data and other information on a group of approximately 200 children who had experienced one of these four programs. A full description of the early results of this research can be found in Miller and Dyer (1975).

Today, however, I want to confine my remarks to the long-term effects of the preschool experience at the 6th and 7th grade levels by looking at IQ and achievement test differences.

In 1976-77, approximately 140 children were located again in their seventh year of school. I will report on results from the analyses on the measures of IQ (Weschler Intelligence Scale for Children--Revised) and on two sets of school achievement scores (Stanford Achievement Test--6th and 7th grade points).

The subjects were primarily black, lower-SES children living in Louisville. They were originally selected from the population of Head Start children (in 1968-69). At that time, the mean income of experimentals was approximately $3,000 annually and most of them (about 60%) lived with their mothers only. The Controls had a slightly higher income ($3,680) and most of them (62%) were from intact (2-parent) families. On other demographic variables (e.g., educational level of parents, and number of sibs), the experimentals and controls did not differ. There were no demographic

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differences among experimentals in the four programs. The experimental subjects in this study were originally assigned randomly to prekindergarten programs. "Final" samples have been compared each year to previous samples in order to determine whether the group retained is a biased sample as compared with the attrition group. Table 1 describes the 6th and 7th grade samples with the original group on three dimensions: income, percentage of two-parent families, and percentage black.

Analyses and Results

For each achievement test, several samples were available. Since different children missed different subtests, the largest sample was the N for each particular test, although these N's represented slightly different samples. The sample of those children for whom all tests were available was smaller but more homogeneous. In most cases, the precision of the analyses was greater for the smaller, more homogeneous sample, thereby increasing the significance. Results reported in this paper are for the larger and more variable samples.

Table 2 shows the mean percentiles, standard deviations, and results of overall analyses of variance on the ten subtests (including Total Reading and Total Math) of the Stanford Achievement Test for each of the four programs at the sixth grade. The results of this analysis indicated two significant differences among the programs on Reading Comprehension ($p = .05$) and Spelling ($p = .05$). The overall Reading Total was significant at the .10 level.

The mean percentiles, standard deviations, and results of overall analyses of variance on the nine subtests (including Total Reading and Total Math) of the Stanford Achievement Test for each program at the 7th grade are presented in Table 3. Here there are three subtests of interest--Reading, Spelling, and Language ($p = .10$).

TABLE 1

Comparison of 1968-69 Demographic Characteristics of Original Samples and Current Sample Within the Four Prekindergarten Programs

Program	N	Original Samples			N	Current Samples		
		1968-69 Income	1968-69 % Black	1968-69 % 2-Parent Families		1968-69 Income	1968-69 % Black	1968-69 % 2-Parent Families
Bereiter-Engelmann	64	$2943	97	33	31	$2838	97	39
Darcee	64	$3148	88	35	29	$3440	90	55
Montessori	33	$2886	100	27	20	$2558	100	25
Traditional	53	$3170	89	42	29	$3009	90	55

TABLE 2

6th Grade Achievement: Mean Percentiles, Standard Deviations, and Results of Overall Analyses of Variance for All Subtests of the Stanford Achievement Battery for all Subjects for whom Data are Available

		B-E	DARCEE	MONT	TRAD	F	∝
Vocabulary	N	23	26	18	24	0.8056	ns
	$\bar{X}$	30.70	23.88	28.33	21.58		
	S.D.	26.73	21.01	20.80	19.42		
Reading Comprehension	N	23	26	18	24	2.9903	.05
	$\bar{X}$	32.09	22.38	38.94	23.08		
	S.D.	22.25	20.52	21.76	19.41		
Word Study Skills	N	21	22	17	22	0.9983	ns
	$\bar{X}$	31.90	26.00	37.82	28.50		
	S.D.	21.26	21.26	26.39	25.12		
Math Concepts	N	22	26	17	24	0.8931	ns
	$\bar{X}$	25.14	22.73	32.88	24.20		
	S.D.	21.59	18.44	23.92	20.39		
Math Computation	N	19	24	17	23	1.9780	ns
	$\bar{X}$	35.89	28.29	45.59	33.26		
	S.D.	20.43	23.60	28.58	18.44		

TABLE 2 (Cont'd)

		B-E	DARCEE	MONT	TRAD	F	α
Math Applications	N	21	24	17	23	1.4846	ns
	$\overline{X}$	24.05	26.67	36.47	28.00		
	S.D.	19.97	18.46	20.21	17.06		
Spelling	N	21	24	18	23	3.2687	.05
	$\overline{X}$	44.43	27.83	47.89	29.82		
	S.D.	25.98	24.16	29.98	23.34		
Language	N	20	24	18	23	1.8350	ns
	$\overline{X}$	33.30	23.75	36.56	24.00		
	S.D.	20.84	18.21	26.89	21.87		
Reading Total	N	23	24	18	24	2.2672	.10
	$\overline{X}$	30.17	23.46	37.39	22.63		
	S.D.	19.45	19.00	23.87	20.51		
Math Total	N	19	24	17	23	1.6934	ns
	$\overline{X}$	27.74	24.46	38.24	27.83		
	S.D.	20.13	19.10	24.87	16.08		

TABLE 3

7th Grade Achievement Mean Percentiles, Standard Deviations, and Results of Overall F Tests for All Subtests of the Stanford Achievement Battery for all Subjects for whom Data are Available

		B-E	DARCEE	MONT	TRAD	F	∝
Vocabulary	N	23	25	20	21	0.0320	ns
	X	22.65	23.24	24.55	24.19		
	S.D.	22.53	21.03	24.02	23.39		
Reading	N	22	25	20	21	2.5555	.10
	$\overline{X}$	30.45	17.04	30.06	31.33		
	S.D.	22.59	16.65	23.26	21.85		
Math Concepts	N	25	23	19	21	1.1435	ns
	$\overline{X}$	25.16	21.00	30.16	29.81		
	S.D.	18.09	17.30	23.05	17.13		
Math Computation	N	24	23	20	23	1.6886	ns
	$\overline{X}$	30.70	23.70	36.75	24.57		
	S.D.	18.43	22.55	26.90	18.28		

TABLE 3 (Cont'd)

		B-E	DARCEE	MONT	TRAD	F	∝
Math Applications	N	24	24	20	22	2.0399	ns
	$\bar{X}$	25.83	21.75	34.85	20.55		
	S.D.	21.32	18.79	24.88	17.73		
Spelling	N	23	25	20	24	2.2185	.10
	$\bar{X}$	34.43	22.36	41.15	29.29		
	S.D.	22.70	24.11	32.59	25.30		
Language	N	24	25	20	23	2.4878	.10
	$\bar{X}$	32.54	18.92	33.05	33.30		
	S.D.	22.96	19.38	23.13	22.42		
Total Reading	N	22	25	20	21	1.0721	ns
	$\bar{X}$	26.36	17.92	26.95	27.57		
	S.D.	22.26	18.33	22.26	23.09		
Total Math	N	24	22	19	19	1.5647	ns
	$\bar{X}$	25.75	20.23	33.32	21.84		
	S.D.	19.23	19.92	26.15	17.03		

A second step of data analysis involved performing four multivariate analyses of variance in which each Head Start program was compared with the other three programs using Total Reading and Total Math scores on the Stanford Achievement Test and Verbal and Performance IQ scores on the WISC-R. Although there were no statistic lly significant overall program differences, the Montessori program did show a consistent superiority to the other three programs.

Table 4 presents achievement levels at the end of 6th and 7th grades for children from the four prekindergarten programs. Table 4 shows that all experimentals made average gains of six months in Total Reading and gains of an average of one month on Total Math. Bereiter-Engelmnn, Darcee, and Traditional classes remained at Grade 7, one year behind grade level with Montessori less than one year behind. IQ's at the end of 7th grade for children from the four programs are shown in Table 5. There were no significant IQ differences between the groups.

Discussion

One major finding of this study isthat at the 6th and 7th grade levels, long-term program differences on achievement are still found, pointing to the importance of the type of preschool program for the child.

Several hypotheses can be offered for the consistent superiority of Montessori children over those from the other three preschool programs from first grade on. The Montessori program views the young child as naturally curious, innately eager to learn, and capable of intense concentration. Perhaps this attitude on the part of the teachers became a self-fulfilling prophecy. We did not measure self-esteem. Possibly the Montessori children came to see themselves more as "students."

TABLE 4

Achievement Levels at the End of 6th and 7th Grades for Children from Four Prekindergarten Programs (Percentiles and Grade Equivalencies)[a]

	Total Reading[b]						Total Math[b]					
	6th Grade			7th Grade			6th Grade			7th Grade		
	N	%iles	G.E.	N	%iles	G.E.	N	%iles	G.E.	N	%iles	G.E.
Bereiter-Engelmann	23	30	5.6	22	26	6.0	19	28	5.9	24	26	6.1
DARCEE	24	23	5.0	25	18	5.4	24	24	5.7	22	20	5.7
Montessori	18	37	6.0	20	27	6.2	17	38	6.4	19	33	6.6
Traditional	24	23	5.0	21	28	6.3	23	28	5.9	19	22	5.8

[a]Sample sizes vary from year to year.

[b]Stanford Achievement Test--Intermediate for Grade 6; Stanford Achievement Test--Advanced for Grade 7.

TABLE 5

WISC-R IQ's at the End of 7th Grade for Children from Four Prekindergarten Programs

Program	N	Full Scale IQ
Bereiter-Engelmann	30	82.9
Darcee	29	84.9
Montessori	20	87.4
Traditional	29	85.2

A second hypothesis concerns educational philosophy of the programs. Both Bereiter-Engelmann and Darcee programs were remedial and preparatory, emphasizing immediate skill development. Montessori and Traditional, on the other hand, were oriented toward long-term development--and they did have delayed effects. While Montessori children maintained superiority over several years, Traditional children (as seen in Table 4) did make substantial gains of 13 months on Total Reading on the Stanford Achievement between Grades 6 and 7. The Montessori advantage may have appeared earlier because Montessori focused on cognitive skills as opposed to the social development and motivational skills emphasized by the Traditional Program. Since the gain for Traditional has occurred only at the last testing period, it remains to be seen whether it represents a true sleeper effect.

Because of the interesting questions raised, these data point toward the need for additional years of study to see whether these patterns remain or differences between thegroups will fade.